# The *Vigna unguiculata* complex (Fabaceae) in southern Africa

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Proposals are made toward the infraspecific delimitation of taxa in the *Vigna unguiculata* complex. Only the forms occurring naturally in Africa are considered. A study of herbarium collections and extensive field work in southern Africa have led to a reassessment of the complex, resulting in the recognition of seven infraspecific taxa, namely *V. unguiculata* subsp. *protracta* (E. Mey.) Pienaar, subsp. *dekindtiana* (Harms) Verdc. with two varieties, var. *dekindtiana* and var. *huillensis* (Welw. ex Bak.) Pienaar, subsp. *tenuis* (E. Mey.) Maréchal *et al.* with two varieties, var. *tenuis* and var. *ovata* (E. Mey.) Pienaar, subsp. *stenophylla* (Harv.) Maréchal *et al.* and subsp. *mensensis* (Schweinf.) Verdc. The paper provides a key to the subspecies and varieties in Africa, the typification of the names and synonymy.

Infraspesifieke afbakening van taksons in die *Vigna unguiculata*-kompleks word voorgestel. Alleenlik dié vorms wat natuurlik in Afrika voorkom, word behandel. 'n Ondersoek van herbariumeksemplare en uitgebreide veldwerk in Suider-Afrika het daartoe gelei dat sewe infraspesifieke taksons erken word, naamlik *V. unguiculata* subsp. *protracta* (E. Mey.) Pienaar, subsp. *dekindtiana* (Harms) Verdc. met twee variëteite, var. *dekindtiana* en var. *huillensis* (Welw. ex Bak.) Pienaar, subsp. *tenuis* (E. Mey.) Maréchal *et al.* met twee variëteite, var. *tenuis* en var. *ovata* (E. Mey.) Pienaar, subsp. *stenophylla* (Harv.) Maréchal *et al.* en subsp. *mensensis* (Schweinf.) Verdc. Hierdie ondersoek verskaf 'n sleutel tot die subspesies en variëteite in Afrika, die tipifisering van die name en hul sinonimie.

**Keywords**: Africa, Cowpea, Fabaceae, Phaseoleae, style, taxonomy, *Vigna*.

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## Introduction

Taxonomic research on the wild forms of *Vigna unguiculata* (L.) Walp. is of particular interest because the cultivated form of this species is an important crop and source of protein in the tropics. Commonly known as the Cowpea or 'Kafferboontjie', this species is the subject of intensive breeding studies in many parts of the world, and in particular at the International Institute for Tropical Agriculture at Ibadan, Nigeria. In this respect southern Africa is regarded as a largely unexploited genetic reservoir for the species. For example, the wild relative, *V. unguiculata* subsp. *dekindtiana* (Harms) Verdc. var. *protracta* (Maréchal *et al.* 1978) is considered to be 'an effective parent for conferring pubescence to Cowpea, because the resistance to insects would best be served by developing genotypes with pubescent leaves' (communication from Dr A.E. Hall, University of California, USA, in PRE, 1987-10-27).

The genus *Vigna* Savi belongs to the tribe *Phaseoleae* L. (subfamily Faboideae, family Fabaceae) and includes about 150 species distributed mainly throughout the tropics of both hemispheres. Five subgenera are recognized in the genus by Verdcourt (1971) and seven by Maréchal *et al.* (1978). Jaaska and Jaaska (1988) raised the status of section *Catjang* (DC.) Verdc. (1970) in the subgenus *Vigna* to that of subgenus. Four of these subgenera are represented in southern Africa, namely *Vigna, Plectrotropis* (Schumach.) Verdc., *Catjang* (DC.) Jaaska & Jaaska and *Haydonia* (Wilcz.) Verdc.

Subgenus *Catjang* includes *V. unguiculata* and all its infraspecific taxa, as well as *V. nervosa*, which species is not dealt with in detail in this article. This will be done in the complete classification of *Vigna* in southern Africa, in a later publication.

The name *Catjang*, frequently spelled *Catiang*, originated in the Orient as *Catjang* (Gove 1961), the Malayan and Sundanese name of a bean or the 'pigeon' pea, and was accepted in that form into the Dutch vocabulary. Linnaeus (1771) cites *Burm. ind. 161* for his *Dolichos catiang*, which Burman the Younger (1768) had actually named *Dolichos catjang* Burm. f., reverting to the original spelling. As to the correct spelling of the name *Catjang*, it would appear that the original form is *Catjang* (*Catjung*, fide Westphal p.223, 1974). Linnaeus made a new combination for Burman's *D. catjang* as *D. catiang* in his *Mantissa* (1771) and this version enjoys preference. However, Article 73.1 of the ICBN (Greuter *et al.* 1988) recommends that the original spelling of names should be retained and Article 73.5 recommends that, where the spelling is changed as a result of Latin usage (*i.e.* where 'i' is used because of the absence of 'j' in Latin), the original spelling be restored. We have therefore adopted *Catjang* as the correct spelling of this new subgeneric name [previously section *Catiang* (DC.) Verdcourt].

De Candolle (1825) first referred to *Catjang* as a section with 'legumina cylindrica'. No mention is made of the stipules with spurs below the point of attachment. The presence of these characteristic spurs was first recorded by Schumacher (1829) when describing *Dolichos oleraceus* Schumach. & Thonn., although no mention was made of *Catjang*. E. Meyer (1836) united sections *Catjang* and *Unguicularia* DC. as section *Catjang* (DC.) E. Mey. of the genus *Scytalis*, the discerning character being the bearded style. Walpers

(1839) published the new combination *Vigna catjang* (Burm. f.) Walp. [syn. *Scytalis catjang* (Burm. f.) E. Mey.].

Verdcourt (1970, 1971) reinstated *Catjang* ('*Catiang*') as a section of *Vigna*, characterized by stipules distinctly spurred at the base, or often distinctly peltate [hence Harms's (1915) sect. *Appendiculatae* Harms for the group]; keel obtusely beaked, slightly incurved, canoe-shaped and without pockets (as in section *Plectrotropis*); style with the thickened part slightly curved and a short upturned or horizontal beak beyond the stigma, and pollen sculpture of a wide reticulation of raised muri (Figures 1 & 2).

Verdcourt (1970) noted that no herbarium specimen representing Linnaeus's type for *V. unguiculata*, cultivated from seeds from Barbados, is preserved in his Uppsala herbarium, nor in the Linnean herbarium in London. Article 37.1 of the ICBN (Greuter *et al.* 1988) states that 'the publication on or after 1 Jan. 1958 of the name of a new taxon of the rank of genus, or below, is valid only when the holotype of the name is indicated'. In an earlier issue of the ICBN (Lanjouw *et al.* 1966), the publication directly affecting Verdcourt's decision regarding the typification of the cultivated *Vigna* species, declares it possible to accept 'a description or figure' as type for a name. However, Verdcourt (1970, 1971) did not do this, only proposing (Verdcourt 1970, p.543) that it should irrevocably be accepted that Linnaeus's (1753) specimen was a cultivated Cowpea from Barbados for which no specimen could be traced.

Article 9.1 of the 1988 Code states that the 'holo-, lecto- or neotype of a specific or infraspecific taxon is a single specimen or illustration', a description being apparently no longer acceptable. For the latter, Jacquin's (1770) description and illustration appear to be appropriate. However, the origin of the plant is not mentioned and the erect pods indicate the *Catjang* Cowpea, *i.e.* the cv. gr. *biflorus* (L.) Westphal (1974).

After much consideration regarding the origin of *Vigna unguiculata*, it could not be denied that Linnaeus's specimen came from the Barbados whereto it must have been introduced 'from anywhere in the tropics' (Westphal 1974). According to Faris (1965), the most commonly cultivated Cowpea and the wild ones belong to the group of *Vigna* species that fall into the *V. sinensis* (L.) Savi group. The seed of the cultivated forms vary from pink to white with a black hilum, to the mottled ones of the wild Cowpeas, whereas the wild forms always have relatively mottled seed. The character that separates wild from cultivated forms of *V. sinensis*, *i.e.*, the explosive action of the legume of the wild forms, is controlled by at least one dominant gene (Faris 1965). The area from which the forms of *Vigna unguiculata* originated, is West or Central Africa. Consequently, Westphal's neotype, grown and preserved at Wageningen, with isoneotypes deposited at Kew and Paris, and grown from seeds collected in Ethiopia where this pulse has been cultivated 'from times immemorial', is acceptable. For Westphal's complete argumentation, see Westphal (1974: pp. 222 – 224).

A second problem facing Verdcourt (1970) was whether all members of section *Catjang* (with the exception of *V. nervosa*), whether cultivated or natural, should be included, with equal status, in the same species, *V. unguiculata*, or to group the genetically improved, cultivated forms on their own. The main differences appear to be the more erect,

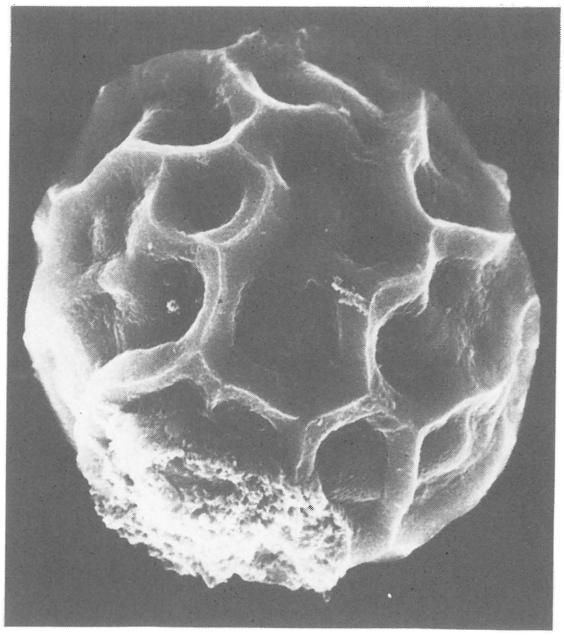

**Figure 1** Pollen grain sculpture in *Vigna unguiculata* subsp. *stenophylla*. Note the wide reticulation of raised muri — characteristic for members of *Vigna* section *Catjang*.

glabrous, pale-flowered and generally larger cultivated plants bearing large, indehiscent, pale yellow fruits with brightly coloured seeds as opposed to the wild forms which are generally vigorous twiners with obvious pubescence, brightly coloured blue, mauve or purple flowers and small, erect, black, variously pubescent and dehiscent fruits with small, grey, brown or mottled seeds.

Only since 1970 has the section *Catjang* (DC.) Verdcourt been applied to those species of *Vigna* bearing stipules extended by means of a spur beyond the point of attachment. Verdcourt (1970) divided *V. unguiculata* into two subspecies [subsp. *dekindtiana* (Harms) Verdc. and subsp. *mensensis* (Schweinf.) Verdc.] to accommodate the wild forms, and three subspecies [subsp. *unguiculata*, subsp. *cylindrica* (L.) Verdc. and subsp. *sesquipedalis* (L.) Verdc.] to accommodate the cultivated forms, all enjoying equal status. One variety (*V. unguiculata* var. *protracta* (E. Meyer) Verdcourt is also wild. *V. pubescens* Wilczek, *V. tenuis* (E. Meyer) Dietrich and *V. angustifoliolata* Verdcourt were also included in the section as individual species.

Maréchal *et al.* (1978) referred to the work done by Westphal (1974) at Wageningen in which he recognized four so-called cultivar groups, namely cv. gr. *unguiculata*, cv. gr. *biflora* (L.) Westphal, cv. gr. *sesquipedalis* (L.) Westphal and cv. gr. *textilis* (A. Chevalier) Westphal, for the cultivated forms as opposed to the natural forms. They proposed that all should be included under *V. unguiculata* subsp. *unguiculata*. For the cultivar group bearing the latter name, a neotype was proposed, *Westphal 8682* (WAG, neo, K, P, isoneo.). Maréchal *et al.* regarded this arrangement as a very logical solution to define the genetic entities forming the basis of all existing cultivars. Ohashi (1975), however, preferred the status of variety for the cultivar groups since he approached the problem from the floristic point of view. We incorporate all cultivated forms under subsp. *unguiculata*, with informal cultivar groups reflecting the various genetic entities. Maréchal *et al.* proposed, furthermore, to

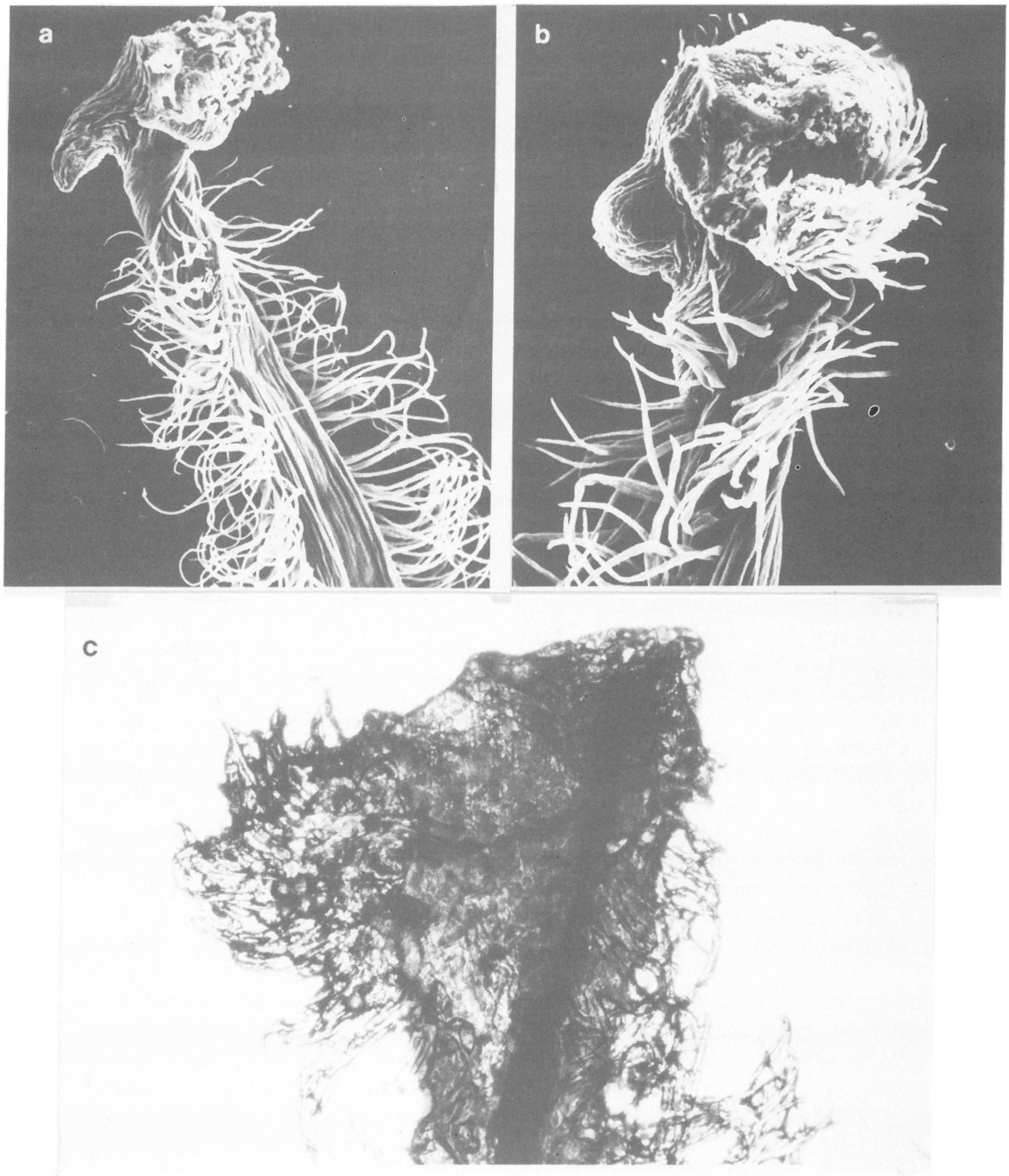


**Figure 2** Representative examples of stigma and pollen brush morphology in subspecies of *Vigna unguiculata*. Note stigma, hammer-shaped, style elongation horizontal. **a.** *V. unguiculata* subsp. *dekindtiana* var. *dekindtiana*, ×16 (*Pienaar 1389*). **b.** *V. unguiculata* subsp. *stenophylla*, ×32 (*Pienaar 1366*). **c.** *V. unguiculata* subsp. *mensensis*, ×20 (*Schweinfurth 1820*).

include subsp. *mensensis*, *V. pubescens* and var. *protracta* as varieties of subsp. *dekindtiana*. *V. tenuis* was reduced to a subspecies and *V. angustifoliolata* was reduced to a synonym of subsp. *stenophylla* (Harv.) Maréchal *et al.*

According to Maréchal *et al.* (1978), the pollen grains of subspecies *Catjang* are larger than in the other Phaseoleae members. They recognized only two species in their section *Catjang*, namely *V. unguiculata* (L.) Walp. which is most variable and complex, and *V. nervosa*. The wild forms of *V. unguiculata* occupy almost the whole of tropical Africa, the greatest variability amongst them believed to be concentrated in southern Africa.

In southern Africa, the genus *Vigna* as a whole has not been revised since the revision by Harvey and Sonder (1862), and in this paper only those species included in the *V. unguiculata* complex are to be treated. Although the epithet *unguiculata* did not figure at all in Harvey's revision, he did recognize *V. tenuis* (E. Meyer) Dietrich and *V. triloba* Walpers nom. illeg. (Verdcourt 1968) (= *Dolichos trilobus sensu* Thunberg and *Scytalis protracta* E. Meyer). He also proposed a new variety, namely var. *stenophylla* Harvey, under *Vigna triloba*. Harvey employed characters regarding the number of flowers, leaf texture and shape, calyx and stipules to construct his infraspecific key. Since, Verdcourt (1970) has pointed out how precarious leaf shape and calyx characters are in treatments of *Vigna*.

Burtt Davy (1932) revised the genus *Vigna* for the Transvaal and Swaziland only, also not mentioning the epithet *unguiculata*. He introduced *V. stenophylla* Burtt Davy non Harms (= *V. triloba* var. *stenophylla*), *V. triloba*

(= *Dolichos trilobus sensu* Thunb. and *Scytalis protracta*), *V. rhomboidea* Burtt Davy, *V. sinensis* (L.) Endl. (= *Dolichos sinensis* L., *V. catiang*), *V. scabrida* Burtt Davy and *V. galpinii* Burtt Davy (= *V. nervosa*). These taxa will be dealt with.

Verdcourt (1970, 1971) and *Maréchal et al.* (1978) published their taxonomic treatments on the genus *Vigna* at this point in time, both contributions influencing the southern African concepts of the genus.

According to Gibbs Russell *et al.* (1987), the group of *Vigna* species in southern Africa belonging to the *Vigna unguiculata* complex includes, in alphabetical order, *V. angustifoliolata* Verdcourt, *V. huillensis* Welwitsch *ex* Baker, *V. nervosa, V. tenuis, V. unguiculata* subsp. *dekindtiana* (Harms) Verdcourt and *V. unguiculata* subsp. *unguiculata*. The above information was partially drawn from the treatment of Verdcourt (1970), as interpreted and used by the staff in the herbarium at PRE.

De Wet *et al.* (1989) placed *V. huillensis* into synonymy with *V. unguiculata* subsp. *dekindtiana*, as indicated by Verdcourt (1970) and Maréchal *et al.* (1978), and in 1990 De Wet *et al.* merely referred to the taxonomic treatment of *Vigna* by Verdcourt (1971), without making any recommendations as to the acceptability of taxa and names. Verdcourt (1970, 1971) as well as Maréchal *et al.* (1978) recognized *V. nervosa* (= *V. galpinii*) as a species belonging to the *V. unguiculata* group of *Vigna* and therefore as a member of subgenus *Catjang* (Jaaska & Jaaska 1988), despite its rather different facies, the common character being the spurred stipules.

The aim of the present study is to evaluate the classification proposals made by recent authors such as Verdcourt (1970, 1971) and Maréchal *et al.* (1978), and to determine whether they are applicable to southern African material and, where necessary, to make recommendations to accommodate those endemic taxa not fully covered by the latter workers. An attempt is made to consider the southern African taxa of subgenus *Catjang* in the light of existing taxonomic treatments, combined with personal work in the field and the herbarium. The principle motive is to avail workers of information and a workable key by which to identify the various taxonomic entities in southern Africa. Detailed descriptions are provided for all taxa native to the region.

## Materials and Methods

Herbarium specimens from BR, BM, BOL, J, K, LISC, NBG, NH, P, PRE, PRU, SAM, SRGH and DWU were studied.

Extensive field work was done so that first-hand observations of live material could be made; seedlings and older plants were transplanted in the nursery of the National Botanical Institute, Pretoria, so that ample material was available for detailed comparative investigation. SEM studies were conducted, amongst others, of the style prolongation beyond the stigma and valuable deductions were made.

Distribution maps and explanatory tables were constructed to aid in the delimitation of taxa. Localities were plotted according to the grid reference system of Edwards and Leistner (1971). Citation of specimens is purely representative, *i.e.* one specimen per grid, a complete list being available on request.

## Taxonomy

***Vigna unguiculata*** (L.) *Walp.*, Repertorium botanices systematicae 1: 779 (1842); Wilczek: 387, t. 30 (1954); Hepper: 569 (1958); Verdc.: 542 (1970); Verdc.: 642 (1971); Maréchal *et al.*: 190 (1978); Baudoin & Maréchal: 6 (1985). Type: designated by Westphal (1974); plant cultivated from seed collected in Ethiopia, *Westphal 8682* (WAG, neo.; K, P, isoneo.).

*Dolichos unguiculatus* L.: 725 (1753). Type from Barbados; presumably grown at UPSV from seed, but no specimen found (neotype designated by Westphal).

Herbaceous annual or perennial, erect, trailing or twining, cultivated or wild, chiefly in grassland, but also in open woodland and woodland edges. *Root system* shallow, adventitious or turbinate tubers, nodules common on all systems. *Stems* variable in thickness, patent, pubescent to aculeate, scabrid to glabrous, hairs colourless. *Leaflets* variously shaped, from obtusely trilobed to more or less triangular-rhomboid to elongate-hastate, texture variable from soft chartaceous to coriaceous, pubescence variable from strigose on both lamina surfaces to sparsely strigose on dorsal nerves only (Figure 3). *Stipules* typically spurred, *i.e.* appendaged below the point of attachment; variable from large, broadly ovate and most obvious, green, extremely strigose and ranging to hairy on ribs only or glabrous, to relatively small, lanceolate, brown and glabrous, all margins ciliate (Figure 3). *Inflorescence* axillary, a raceme varying from elongated with 4–7 flowers to contracted with 2 flowers, extrafloral nectaries alternating with flowers. *Flowers* blue, mauve, purple to pinkish mauve. *Calyx* campanulate, lobes longer or shorter than tube, variably strigose, the two upper lobes connate up to half their length, rugose and plicate with age. *Standard* known to snap closed from the time of anthesis to a few hours later, buff or yellowish on outer surface so that the closed flower appears to be yellow as reported by many collectors, oblate, upper pair of calluses narrow, perpendicular, more or less parallel or divergent (Figure 4, greater detail in t. 30, Wilcz., 1954). *Keel* straight, obtuse, slightly canoe-shaped, paler mauve to white, contains no pockets. *Stamens* 9, connate to form an open tube in the lower part, free filaments of two lengths, anthers entangled with dorsal style brush (Lavin & Delgado 1990) so that they distribute pollen when forced through the rigid keel opening as it is suppressed by visiting insects, vexillary stamen free, geniculate at base. *Nectary* collar-shaped, lobed, surrounding base of ovary. *Ovary* pilose to pubescent or puberulous with long stiff hairs along the suture. *Style* elongation extended horizontally or up to an angle of *ca.* 45° beyond the stigma, flattened, rounded or truncate, 0.2–0.8 (–1.0) mm long, the whole appearing hammer-shaped (Figure 2). *Legumes* erect or pendant, black to yellow, varyingly pubescent to glabrous, from *ca.* 200–300 mm in cultivated forms (900 mm in cv. gr. *sesquipedalis*) and *ca.* 60–100 mm long in the wild forms, beaked, twisted spirally for seed dispersal in wild forms, non-dehiscent in cultivated forms. *Seeds* variable in colour from white, red, light to dark brown or black, often mottled, size

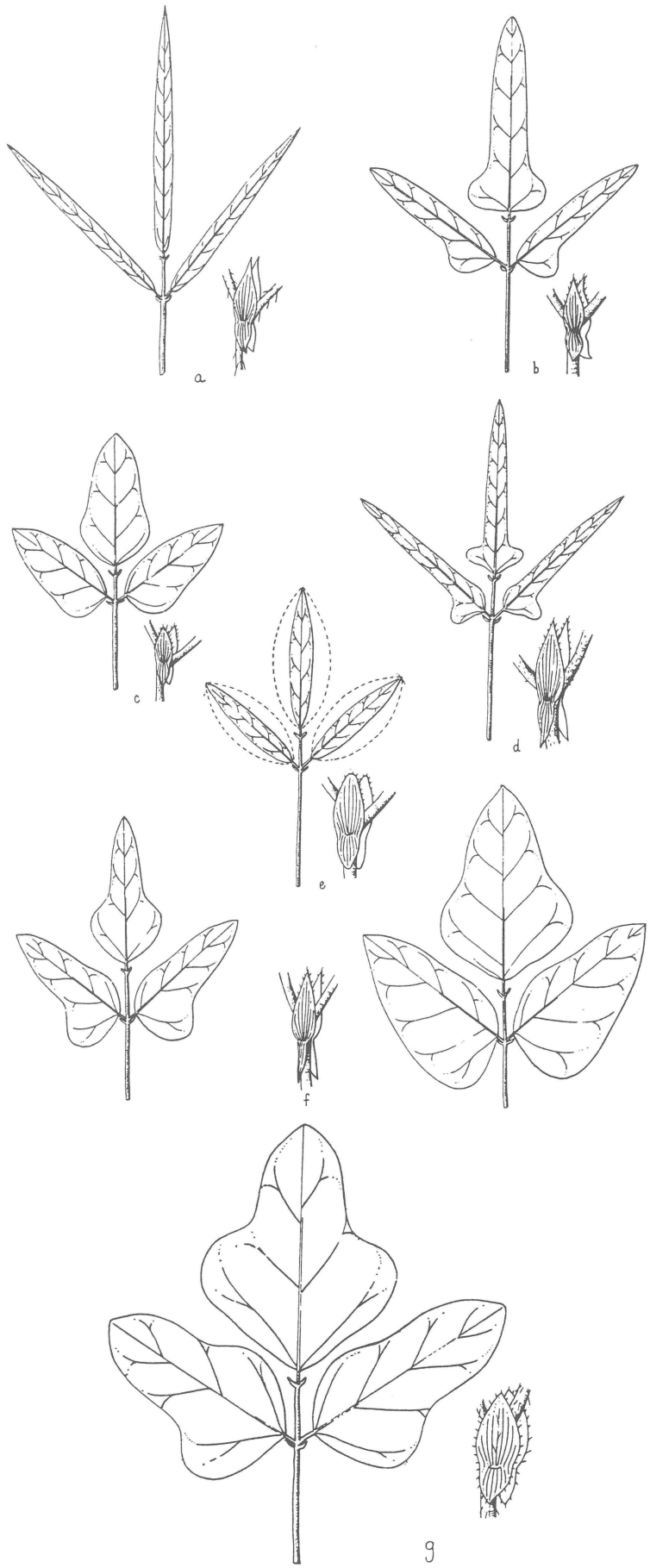


**Figure 3** Representative leaves (×0.6) and *stipules* (×1.2) of the different subspecies and their varieties in the wild forms of *Vigna unguiculata*, and of *V. nervosa*. **a.** *V. unguiculata* subsp. *stenophylla*. **b.** *V. unguiculata* subsp. *tenuis* var. *tenuis*. **c.** *V. unguiculata* subsp. *tenuis* var. *ovata*. **d.** *V. unguiculata* subsp. *dekindtiana* var. *huillensis*. **e.** *V. nervosa*. **f.** *V. unguiculata* subsp. *dekindtiana* var. *dekindtiana* (also subsp. *mensensis*) — note two types of leaves often present on the same plant. **g.** *V. unguiculata* subsp. *protracta*.

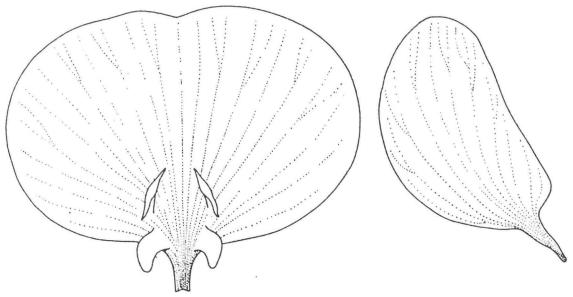

**Figure 4** Standard and wing of *Vigna unguiculata* (subsp. *protracta*) — illustrating the prevailing shape for the species, ×2 (*Pienaar 403*).

variable from 6–9 mm in cultivated forms, much smaller in wild forms, hilum eccentric, aril ring-like.

In southern Africa the subgenus *Catjang* is represented by *V. unguiculata* with five subspecies, and *V. nervosa*.

## Key to species and infraspecific taxa of *Vigna* subgenus *Catjang* in Africa

1a. Flowers solitary, small, standard reniform, *ca.* 8.0 × 9.5 mm, keel up to 8 (–10) mm long, pink to purple ..... ***V. nervosa***

1b. Inflorescence racemose, robust and elongate, 4–7-flowered, or contracted with *ca.* 2 flowers only, flowers large with standard orbiculate-obovate, up to 22 × 25 mm, blue, purple or pinkish mauve ..... **2**

2a. Style elongation 0.5–0.8 (–1) mm, often inclined at 45°. Stems patently hairy or velvety. Stipules conspicuously large, up to 20 × 8 mm, broadly ovate, dark green, indumentum varying from abundantly strigose to sparingly hairy over the entire surface or on veins only or glabrous, margins always coarsely ciliate. Calyx lobes longer than tube ..... ***V. unguiculata* subsp. *protracta***

2b. Style elongation 0.1–0.4 mm long, always horizontal. Stems puberulous to sparingly patent. Stipules not conspicuously large, *ca.* 6–14 × 2–4 mm, ovate to narrowly ovate to lanceolate, brownish or green, glabrous, margins with apical cilia only. Calyx lobes shorter or longer than or equalling tube ..... **3**

3a. Leaflets usually 60–100 × 50–70 mm, rhombic-ovate, more or less uniform in size and shape, or lower leaflets so and upper leaflets hastate, of varying size, or all leaflets hastate, or oblong, or lanceolate to linear, apex acute to shortly acute, chartaceous or coriaceous. Stems thinner than in var. *protracta* but not particularly so, cylindrical or grooved, glabrous to scarcely patent, variously branched ..... **4**

3b. Leaflets usually 25–50 × 20–75 mm, uniformly triangular to rhombic or oblong, or *ca.* 20 × 2–120 × 10 mm, narrow-linear leaflets much longer than broad, apex acute to acuminate or obtuse, papyraceous or coriaceous. Stems thin, glabrous or glabrescent, or angular and sometimes patent but not particularly thin, normally branched from main stem along the vine ..... **6**

4a. Root system markedly shallow, sometimes thickening, much branched. Stems scarcely patent, scabrid or glabrous, angular, much branched horizontally at soil level, green to red. Leaflets papyraceous, uniformly elongate-triangular or lower leaflets elongate-triangular and upper leaflets hastate, glabrous, red-veined or flushed red on undersurface, apex acute. Stipules lanceolate or ovate, spurs long or short and adnate, often red. Calyx lobes shorter or equalling the tube ..... ***V. unguiculata* subsp. *dekindtiana* var. *dekindtiana***

4b. Root system a woody or fleshy tap root. Stems glabrous or subglabrous, grooved or cylindrical, herbaceous or woody, branched at intervals along the vine. Leaflets coriaceous or papyraceous, hastate with basal lobes rounded or ovate-rhombic throughout or at the base of the plant only and hastate further along the vine, glabrous, blue-green with grey-green markings or bright green with paler markings, totally glabrous or lower veins strigose, apex acute or shortly acute. Stipules lanceolate or ovate, spurs reflexed or adnate to the stem. Calyx lobes shorter or markedly longer than the tube ..... **5**

5a. Root system woody. Stems cylindrical, usually subglabrous, woody, profusely branched from the base. Leaflets papyraceous, ovate-rhombic, sublobulate, or hastate toward the apex of the vine, bright green with paler markings, totally glabrous, apex acute. Stipule spurs narrow, reflexed. Calyx lobes markedly longer than the tube. Style prolongation reduced ..... ***V. unguiculata* subsp. *mensensis***
(not yet recorded in southern Africa)

5b. Root system a swollen (dauciformis) tap root. Stems angular, glabrous, herbaceous, branched at intervals along the vine, not profusely at base only. Leaflets coriaceous, hastate with basal lobes rounded, blue-green with grey-green markings, strigose along the ventral veins, apex shortly acute. Stipules lanceolate, spurs usually reflexed. Calyx lobes shorter than the tube. Style prolongation up to 0.4 mm ..... ***V. unquiculata* subsp. *dekindtiana* var. *huillensis***

6a. Leaflets either uniformly triangular-rhombic or oblong, bases commonly lobed, apex acute to obtuse. Stems thin, glabrous, often red at the base where leaflets drop but stipules persist. Stipules ovate, small, with spurs broad. Inflorescence a 5- or 6-flowered raceme (only 2–3 maturing), with standard *ca.* 25 × 29 mm. Style elongation *ca.* 0.2–0.4 mm. Legumes *ca.* 60 mm long, black, scabrid with longer, stiff hairs along the suture ..... **7**

6b. Leaflets lanceolate to linear, much longer than broad, seldom basally lobed, apex acuminate. Stems not particularly thin, commonly ridged, scabrid to sparsely patent, green to grey-green. Stipules lanceolate, usually slender-spurred. Inflorescence contracted, usually 2-flowered, with standard *ca.* 14 × 17 mm. Style elongation *ca.* 0.1–0.3 mm long. Legumes *ca.* 100 mm long, grey to black, pubescent ..... ***V. unguiculata* subsp. *stenophylla***

7a. Leaflets oblong, base gibbose, truncate, apex obtuse, lateral leaflets asymmetric, apiculate, thinly textured ..... ***V. unguiculata* subsp. *tenuis* var. *tenuis***

7b. Leaflets triangular to rhombic or essentially ovate, lateral leaflets asymmetric, apex acute or obtuse, apiculate, sometimes leathery ..... ***V. unguiculata* subsp. *tenuis* var. *ovata***

**a. subsp. *unguiculata*.** Verdc.: 543 (1970); Verdc.: 643 (1971); Maréchal *et al.*: 191 (1978).

Westphal (1974) recognized four cultivar groups to represent all the cultivated forms. For these he chose neotypes grown by himself and preserved at WAG., cv. gr. *biflora* alone was based on a description and specimen in Van Royen's herbarium. Only one, the Cowpea (cv. gr. *unguiculata*), occurs commonly under cultivation in southern Africa. This taxon will not be dealt with further as we are concerned with the wild forms only.

**b. subsp. *protracta*** (E. Mey.) Pienaar, comb. et stat. nov.

*Scytalis protracta* E. Mey.: 146, n. 4. (1836). Type: South Africa, Cape, prope Galgebosch, alt. 800 ped., *Drège IV, C, c* (P!, lecto., designated here, K! isolecto.); inter Gekau et Basche [Mbashe], alt. 1500 ped., *Drège* V, b (P!, K! lectopara.).

*S. hispida* E. Mey.: 146, n. 3. (1836). Drège: 148, n. 44 (1843). *Vigna hispida* (E. Mey.) Walp.: 534 (1839). Type: South Africa, Cape, in collibus graminosis prope Omtata, alt. 1500 ped., *Drège V, b*, (P!, holo., K! iso.).

*Vigna triloba* (Thunb.) Walp.: (1839) nom. illeg.

*V. rhomboidea* Burtt Davy: 421 (1932). Type: Transvaal, Tzaneen Estate, *Galpin 1300* (K!, holo.); Berea Ridge, Barberton, *Burtt Davy 2559* paratype (K!, PRE! iso.).

*V. pubescens* Wilczek: 442 (1954). Type: Africa, Lake Albert, Kasenyie, *Bredo 2161* (BR!, holo.).

Robust perennial. *Root* a woody rootstock, tap root system with well-developed branch roots. *Stems* thick, hairs patent, tough, retrorse or short, velvety [as in *V. pubescens* type, *Bredo 2161* (BR)], roots at nodes. *Leaflets* (Figure 3g) strigose, large, 22–80 × 20–60 mm, with 3 rounded, obtuse lobes as in type *Drège IV C, c*, or ovate to lanceolate-rhomboid, broadly triangular to narrowly hastate (*Bredo 2161*), apex rounded to subacute, apiculate, base obtuse or cuneate. *Stipules* striking, large, (2.8–) 4.0–7.7 × 3–9 (–10) mm, dark green, ovate, spur broad at point of attachment, scarcely constricted, adnate to stem, short, oblique or split, strongly ribbed, surface varying from heavily strigose to hairy on ribs only to glabrous, always coarsely ciliate along most of margin. *Raceme* somewhat elongated, 4–7-flowered (buds not all maturing). Flowers large, blue to purple. *Calyx* lobes usually longer than tube, narrowly triangular to linear-acicular, strigose-pubescent. *Standard* 13–22 × 15–25 mm. *Ovary* pilose. *Style* extension oblique, up to 45°, at least 0.5–0.8 (–1) mm long, obtuse or truncate. *Legume* black, erect, linear-cylindrical, pubescent with longish white hairs sometimes rubbing off, 70–90 × 5 mm, up to 18-seeded. *Seeds* dark red-brown with black speckles, 3.0–4.0 × 2.5–3.5 mm.

Most common along the subtropical Natal and Transkeian coast and in the warm grasslands of the Natal midlands, following the coast northward into Zululand, Swaziland, the eastern Transvaal and the southern Transvaal highveld, the latter three areas supporting plants with the usually smaller dimensions and unlobed leaflets (Figure 5). Original collections with typical broad trilobed leaflets came from the eastern Cape, collected by Drège (*Drège 1843*).

The opinion has been voiced by an anonymous referee, that *V. pubescens* occurs only from 1° north to 20° south, and cannot therefore be conspecific with var. *protracta*, but the hairiness of the large stipules noticeably passes through the whole spectrum of a heavy covering, through a stage in which hairs occur on the ridges (nerves) only to a few scattered hairs to none on the rough, papyraceous surface. There does not appear to be a complete discontinuity of the character. The character of leaf shape has already been discarded as valueless.

It has also been recommended that pollen grains be requested from the I.B.P.G.R. collection at Meise, Belgium, to convince ourselves that *V. pubescens* is an independent species. This we shall gladly do, but in the interim we must regard it as conspecific with *V. unguiculata* subsp. *protracta*.

## Selected specimens examined

**—2229** (Waterpoort): Zoutpansberg (–CD), *Codd 6836* (K).
**—2326** (Mahalapye): road verge, 24 km north of Artesia on main Francistown–Gaberone road (–CD), *Mithen 499* (PRE).
**—2330** (Tzaneen): Tzaneen Estates (–CC), *Burtt Davy 2559* (PRE).
**—2425** (Gaberone): 17 km north of Gaberone, Gaberone North Farms (–DB), *Mithen 520* (PRE).
**—2428** (Nylstroom): Mosdene Farm near Naboomspruit (–DB), *De Winter* 721 (K, PRE).
**—2430** (Pilgrim's Rest): Bourke's Luck Mine, hillsides (–DB), *Galpin 14278* (BOL, PRE).
**—2526** (Zeerust): *ca.* 15 km south of Zeerust at Buffelfontein (–CA), *Van der Meulen 592* (PRE).
**—2528** (Pretoria): main road from Pienaar's River to Pretoria (–CA), *Pole-Evans 3938* (K, PRE).
**—2529** (Witbank): near Witbank station (–CC), *Gilfillan 295* (BOL, PRE).
**—2530** (Lydenburg): Lydenburg (–AB), *Wilms TM 5834* (PRE).
**—2531** (Komatipoort): Maid of the Mist Mountain (–CC), *Hutchinson 2466* (K).
**—2624** (Vryburg): Zoetvley Farm, Vryburg (–AA), *Speedy 304* (PRE).
**—2628** (Johannesburg): Brakpan (–AB), *Moss 13247* (BM, J).
**—2629** (Bethal): 25 km from Witbank on road to Hendrina, near Komati Power Station (–BA), *Du Toit 11* (PRE).
**—2630** (Carolina): Carolina (–AA), *Burtt Davy 7391* (PRE).
**—2631** (Mbabane): 4.5 km NE of Motjane (–AA), *Kemp 1011* (PRE).
**—2632** (Bela Vista): top of Lebombo Mountains, Blue Jay Farm (–AA), *Culverwell 1177* (PRE).
**—2730** (Vryheid): Piet Retief (–BB), *Sidey 1957* (PRE).
**—2731** (Louwsburg): *ca.* 15 km from Ngome Forest station, on road to Vryheid (–CD), *Germishuizen 2127* (PRE).
**—2732** (Ubombo): 12.6 km from turnoff on road to Mkuze (–CA), *Retief 232 (PRE).*

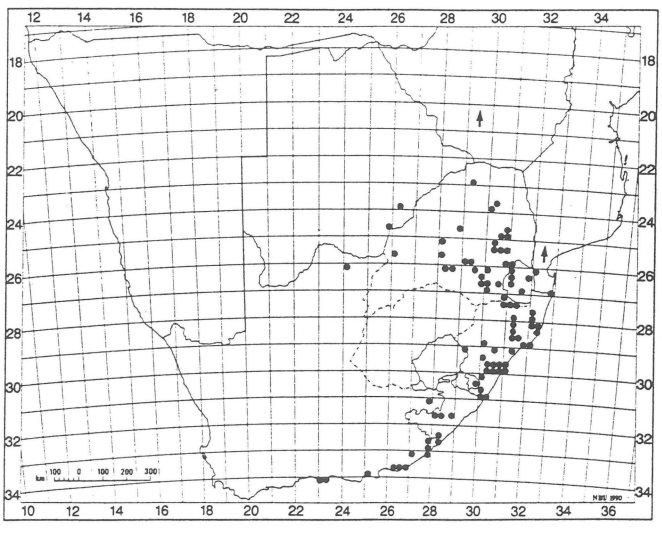


**Figure 5** The known geographical distribution of *Vigna unguiculata* subsp. *protracta* in southern Africa.

—**2830** (Dundee): Weenen, near Estcourt (–CC), *Acocks 10757* (NH, PRE).
—**2831** (Nkandla): Zondela, Mahlabatini (–AD), *Gerstner 4274* (NH).
—**2832** (Mtubatuba): Hluhluwe (–AA), *Cawood GH 51* (PRE).
—**2929** (Underberg): foothills of Drakensberg, Cathkin area (–AB), *Hardy 44* (PRE).
—**2930** (Pietermaritzburg): 12 km from Greytown to Muden (–BA), *Pienaar 403* (K, PRE).
—**2931** (Stanger): Inanda, near Verulam (–CA), *Wood 1083* (BM, K, PRE).
—**3029** (Kokstad): Zuurberg and Clydesdale Mountains (–BD), *Tyson 1697* (SAM).
—**3030** (Port Shepstone): St. Michaels on Sea, open hills 2 km from sea (–CD), *Nicholson 1787* (PRE).
—**3127** (Lady Frere): Engwali [Mgwali] River, near Engcobo (–DB), *Flanagan 2800* (PRE).
—**3128** (Umtata): Bashee [Mbashe] River (–CA), *Schlechter 1873* (PRE).
—**3227** (Stutterheim): grassy hills near Komgha (–DB), *Flanagan 1132* (BOL, NBG, PRE, SAM).
—**3228** (Butterworth): at Kentani (–CB), *Pegler TM 4607* (PRE).
—**3325** (Port Elizabeth): near Galgebosch, alt. 800 ft. (–CC), *Drège IV, C, c* (P, K).
—**3326** (Grahamstown): 5 miles from Alexandria Forest (–CB), *Wells 4228* (K, PRE).
—**3327** (Peddie): near Bats' Cave, East London (–BB), *Schönberg 2804* (PRE).
—**3423** (Knysna): at Knysna (–AA), and Plettenberg Bay (–AB), *Burke s. n.* (BM).

Precise locality unknown:

Zululand, Farm Egoa, *Curson PRE 56130*; *Flanagan 3905* (PRE); Kaffraria, *Guienzius SAM 15594* (SAM); C. Spei, *Fr. Mafron* (BM); C.B.S., Panmure, coast of British Kaffraria, *Ms. Hutton* (K); Swaziland, *Stewart TM 8891* (PRE).

**c. subsp. *dekindtiana*** (Harms) Verdc. in Studies in Leguminosae-Papilionoideae for Flora of Tropical East Africa 4, Kew Bulletin 24,3: 544 (1970); Verdc.: 643, 644 (1971); Maréchal *et al.*: 193 (1978). Type: Angola, Huila, *Dekindt 468* (B†, holo., LISC!, iso.)

*Vigna dekindtiana* Harms: 93 (1902); Bak. f.: 407 (1929); Brenan: 410 (1954).

*V. unguiculata* (L.) Walp. sensu Wilcz.: 387 (1957).

*V. coerulea* Bak: 203 (1871); Bak. f.: 409 (1929). Type: Mozambique, mouth of Zambezi River, Luabo, *Kirk* (K!, holo.).

Annual or perennial. *Rootstock* a swollen taproot (dauciformis) becoming woody with age or markedly shallow, very much branched. *Stems* branched only from the main vine or profusely branched from the primary stem at soil level, green to brown or flushed scarlet, scabrous to glabrous. *Stipules* brown or green flushed scarlet, ovate or narrowly ovate to lanceolate, acuminate, spurs slender, as long as the lobe, or shorter than lobe and broad, acuminate, reflexed from stem or adnate, glabrous except for apical cilia, strongly ribbed, point of attachment mostly constricted. *Leaflets* (Figure 3f) scarcely strigose to glabrous, hairs thickest along dorsal nerves, coriaceous or papyraceous, varying from lanceolate-hastate to ovate-rhombic, all three leaflets basally lobed, the lobes typically round, or apical leaflet sublobular, base cuneate or obtuse, lateral leaflets asymmetric, blue-green with grey-green markings, or bright green with paler markings, apex acute or obtuse, apiculate. *Raceme* contracted, usually 2(-4)-flowered, mauve to violet, with standard 15–20 × 17–22 mm, peduncle often winged. *Calyx* rugose-plicate, lobes as long as tube or shorter. *Ovary* with short pubescence or scabrid, longer along suture. *Style* prolongation horizontal, rounded, usually 0.2–0.4 mm. *Legume* black, cylindrical, scabrid to aculeate, beaked, up to 100 mm long, up to 16-seeded, dehiscing spirally or apparently not. *Seeds ca.* 4.0 × 2.5 mm, mottled greyish brown, aril rim thick.

Two varieties are recognized in Africa:

**i. var. *dekindtiana***

*Clitoria alba* G. Don.: 215 (1832). *Vigna alba* (G. Don) Bak. f.: 407 (1929); Brenan: 410 (1954). Type: S. Tome, *Don* (BM!, holo.).

*V. baoulensis* A. Chev.: 163 (1912); Bak. f.: 408 (1929); Hepper: 569 (1958). Types: Ivory Coast, Baoule, Kodiokoffi, *Chevalier 22356*, and Dyolas, between Danene and Mt. Goula, *Chevalier 21230*, and N. Baoule, between Marabadiassa and Gottoru, *Chevalier 22032* (all P, syn, K!, fragments, isosyn).

*Liebrechtsia scabra* De Wild.: 75 (1902). *Vigna scabra* (De Wild.) Th. & H. Durand: 152 (1909). Type: Lukafu, July 1900, *Verdick 602* (BR!, holo.).

Characterized by a shallow *root* system, stems markedly branched at soil level, *leaflets* ovate-rhombic, papyraceous or with apical leaflets hastate, lateral ones asymmetric (Figure 3f). In the Caprivi and in the north-west of Namibia the leaflets, as well as stems, stipules and veins, may be flushed scarlet. In rainy weather the ripe *legumes* remain straight and closed, apparently waiting for dry weather before dehiscing spirally. Most like the cultivated forms in appearance.

Common through the dry grasslands of the Transvaal, the open woodland grasslands of northern Transvaal, Botswana, central and northern Namibia and apparently ranging into Angola, Zimbabwe, Zambia and further north, *i.e.* the savannah areas of Africa (Figure 6).

### Selected specimens examined

—**1719** (Rundu): Waldensel, Rundu (–DD), *Volk 1963* (PRE).
—**1720** (Sambio): Mashari Experimental Station, Sambio (–CC), *De Winter & Marais 4576* (K, PRE, SRGH).
—**1724** (Katima Mulilo): *ca.* 500 m from Hippo Lodge, Katima Mulilo, open woodland, grass (–AD), *Pienaar 1389* (PRE, WIND).
—**1816** (Namutoni): Etosha National Park, north-east Sandveld, stand 3/72 (–BB), *Le Roux 765* (WIND).
—**1819** (Karakuwisa): 28 miles north of Karakuwisa on Omaramba Omatako River (–DC), *Giess 10121* (PRE, WIND).
—**1820** (Tarikora): Shinyungwa village, on road to Andara (–BB), *Pienaar 1378* (PRE, WIND).
—**1821** (Andara): 2.5 km west of Frans Handari Youth Camp on road to Andara (–AB), *Pienaar 1380* (PRE, WIND).
—**1822** (Kangara): Santsar-Seronga road, 4.2 miles east of Masoko Pan (–CB), *Smith 457* (SRGH).

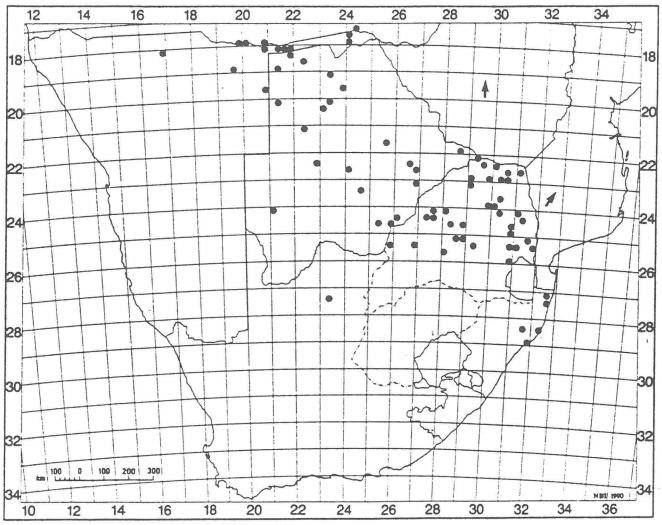

**Figure 6** The known geographical distribution of *Vigna unguiculata* subsp. *dekindtiana* var. *dekindtiana* in southern Africa.

—**1920** (Tsumkwe): Aha Mountains, 10 miles south on Tsumkwe road near the Botswana border (–DB), *Giess 9864* (PRE, WIND).
—**1923** (Maun): 64 km north of Maun on Moremi road (–DB), *Mithen 612* (PRE).
—**2021** (Koanaka Hills): foot of Xwihaba Hills (–AB), *Smith 3368* (PRE).
—**2023** (Kgwebe Hills): Maun, 300 yards from the river on road to Toteng (–AB), *Lampbrecht 33* (SRGH).
—**2122** (Kobe): 0.5 miles north-east of Kuke Camp, roadside (–AB), *Brown* 8714 (PRE).
—**2125** (Lothlekane): central Botswana, Orapa, Baobab Drive (–DA), *Allen 45* (J).
—**2218** (Gobabis): Breytenbach farm, Gobabis (–DC), *Seydel 2515* (BR).
—**2222** (Damara Pan): 121 km from Ghanzi to Kade [Xade] Pan (–BD), *Chadwick 222* (PRE).
—**2224** (Kukumane): Central Kalahari Game Reserve, Metsiamonong, Ghanzi dist. (–CA), *Barnard 275* (PRE).
—**2226** (Serowe): 5 km north of Serowe in river valley (–BC), *Mithen 623* (PRE).
—**2229** (Waterpoort): Dongola Reserve, farm Haakthorne 608 (–BC), *Codd 4136* (K, PRE).
—**2230** (Messina): Venda, Tshianzwane, Makonde Mission, 15 miles north-east of Sibasa (–DC), *Codd 6836* (K, PRE).
—**2231** (Pafuri): Punda Milia [Maria], 3 km from Game Park gate, Kruger National Park (–CA), *Grobbelaar 2335* (PRE).
—**2324** (Kuchwe Pan): 5 km south of Khutse [Kutsi] Gate, Kalahari (–BC), *Chadwick 183* (PRE).
—**2326** (Mahalapye): Experimental Station, Mahalapye (–BB), *Talala 339* (PRE).
—**2329** (Pietersburg): river forest, Blaubergkloof (–AA), *Strey & Schlieben 8588* (PRE).
—**2330** (Tzaneen): Modjaji's Reserve near Duiwelskloof (–CB), *Krige 172* (PRE).
—**2425** (Gaberone): 10 km north of Gaberone, near Sebele Agricultural Research Station (–DB), *Mithen 502* (PRE).
—**2426** (Mochudi): Mochudi (–AC), *Rogers 6400* (PRE).
—**2427** (Thabazimbi): Geelhoutbos farm, Waterberg dist. (–BC), *Germishuizen 360* (K, PRE).
—**2428** (Nylstroom): 39 km north of Nylstroom (–CB), *Codd 2262* (PRE).
—**2430** (Pilgrim's Rest): 1 km from Pilgrim's Rest on road to Bourke's Luck (–DD), *Germishuizen 155* (K, PRE).
—**2431** (Acornhoek): Phalaborwa Water Board, 14 km south of Phalaborwa (–AA), *Retief 387* (PRE).
—**2525** (Mafikeng): Gopane, 25 miles west of Zeerust (–BD), *Snyman 87* (PRE).
—**2526** (Zeerust): at Rietfontein, Zeerust (–BD), *Schoeman TM 4975* (PRE).
—**2528** (Pretoria): Rust de Winter, Pretoria Dist (–BA), *Smuts & Gillett 2135* (PRE).
—**2529** (Witbank): 1 km from Kloof Motel on road to Loskop Dam (–AD), *Germishuizen 3723* (PRE).
—**2530** (Lydenburg): entrance to Rand Mines, Lotzaba Forests, Glenthorpe, *ca.* 28 km from Nelshoogte, in direction of Barberton (–DD), *Pienaar 1357* (PRE).
—**2531** (Komatipoort): 6 km from White River on road to Hazy View (–AC), *Germishuizen 143* (K, PRE).
—**2723** (Kuruman): Kuruman (–AD), *Pole Evans 2080* (PRE).
—**2732** (Ubombo): forestry firebreak road to eastern tip of Lake Sibaya (–BC): *Pooley 252* (PRE).
—**2831** (Nkandla): near entrance to Umlalazi Nature Reserve (–DD), *Pienaar 1365* (PRE).
—**2832** (Mtubatuba): St. Lucia (–AD), *Gerstner 3167* (NH).

Precise locality unknown:
*Junod 3126* (PRE).

**ii. var. *huillensis*** (Welw. ex Bak.) Pienaar in Flora of Tropical Africa: 204 (1871); Hiern: 259 (1896); Torre: 263 (1962–1966). Type: Angola, Huilla, Humpata-Lopollo, *Welwitsch 2264* (LISU, holo., BM, iso.).

Plants characterized by swollen *rootstocks* (dauciformis), long, grooved, herbaceous, prostrate or twining *stems*, branched at intervals along the vine; *leaflets* (Figure 3d) markedly hastate, the basal lobes rounded (the apical leaflets symmetrical and the lateral ones asymmetrical), base bluntly cuneate or obtuse, coriaceous with thickened margins, blue-green marked with grey-green; *calyx* teeth rather shorter than the 'papillose' tube (*fide* Hiern), deltoid; *legumes* glabrous, dehiscing into spirally twisted valves.

Variety *huillensis* is concentrated in the central and western parts of Namibia (Figure 7) where the roasted swollen rootstocks are relished by the Bushmen (San) and other tribes, the dry desert grasslands of the Kalahari (Namibia, Botswana) and the 'bushy pastures' highland areas between 4000 and 5000 feet (Hiern 1896). It may occur that only the apical parts of stems are collected so that the lower parts with rhomboid leaflets are not obvious, but if the leaflets tend to be coriaceous with thickened margins, the diagnosis should be correct.

Circumstantial evidence in favour of our concept includes Baker's original description (1871) of the leaflets as more or less leathery and in which no specific heterophylly is mentioned. Hiern (1896) described the apical leaflet with its 'truncate-cuneate' base typical of *Dekindt 468* (LISC!). The final decision, however, depends on the inspection of *Welwitsch 2264* in BM.

The specimens, *Dekindt 468* (isotype of subsp. *dekindtiana*) and *Dekindt s.n.* (LISC) which we inspected, have leaflets coriaceous with margins thickened, and are linear, hastate and acute. They most closely represent specimens

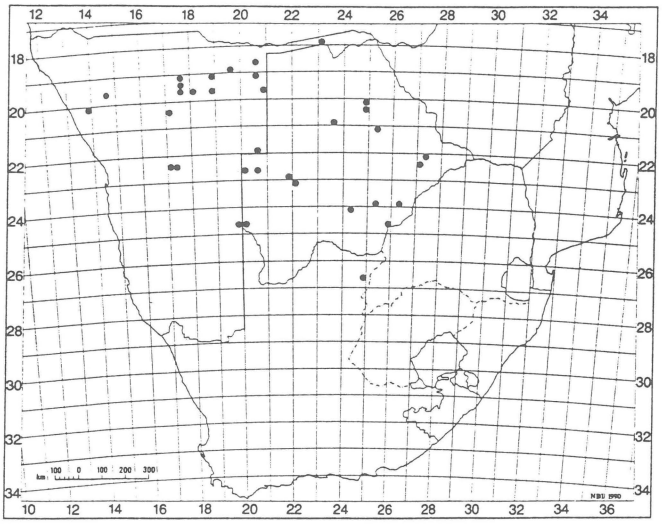

**Figure 7** The known geographical distribution of *Vigna unguiculata* subsp. dekindtiana var. *huillensis* in southern Africa.

collected in Namibia, *Pienaar & Archer 1320*, *Pienaar & Archer 1342* and *Pienaar 1370* (Grootfontein district).

Selected specimens examined:

—**1723** (Singalamwe): Caprivi Zipfel (–CC), *Killick & Leistner 3158* (PRE).

—**1819** (Karakuwisa): Cigarette, north-east of Karakuwisa (–DC), *Maguire 2283* (PRE).

—**1820** (Tarikora): Omaramba Khaudum east of Tamsu (–DA), *De Winter & Marais 4657* (PRE).

—**1914** (Kamanjab): Katembe, 750 ft. (–DA), *Schlechter 11608* (BOL).

—**1916** (Kanoulei): Farm Gladstone, 28 miles west of Otavi (–DB), *De Winter 3007* (PRE).

—**1917** (Tsumeb): farm Okombangora (Peypers), *ca.* 76 km from Otavi, on road from Grootfontein (–DA), *Pienaar & Archer 1342* (PRE, PRU).

—**1918** (Grootfontein): farm Oliewenhof: GR 215, Grootfontein (–CA), *Giess, Volk & Bleissner 6518* (PRE, WIND).

—**1920** (Tsumkwe): bank of Omaramba at Tsotsana (–BA), *Giess 9960* (PRE, WIND).

—**2013** (Unjab Mouth): Rooiplaat (–BB), *Leendertz 8405* (PRE).

—**2017** (Waterberg): Waterberg-Platoberg, dist. Otjiwarongo (–AC), *Jankowitz 1205* (WIND).

—**2023** (Kwebe Hills): alongside Xanakuna–Mosu road (–DC), *Smith 1218* (PRE).

—**2024** (Bushman Pits): Central Kalahari Game Reserve, western part, 114 km east of Lone Tree Pan (–BD), *Verhagen & Barnard 40* (PRE).

—**2120** (Rietfontein): Hereroland, Rietfontein Block, Helena Wilskrag area (–DC), *Adank & Visser s.n.* (WIND).

—**2217** (Windhoek): 32 km north of Windhoek (Continental Hotel) on Okahandja road, 9 km south of Otjehavera River (–AC), *Pienaar & Archer 1320* (PRE).

—**2220** (Kalkfontein): 138 km south-west of Ghanzi (–BA), *Mithen 562* (PRE).

—**2221** (Okwa): 7 km north of Bere (–DD), *Mithen 557* (PRE, SRGH).

—**2222** (Damara Pan): 21 km south of Charles' Hill (–AC), *Mithen 564* (PRE, SRGH).

—**2227** (Palapye): 101 km south of Francistown toward Gaberone (–AB), *Mithen 498* (PRE, SRGH).

—**2322** (Kang): Lokalani, western Kalahari (–AB), *Vahrmeijer & Steele 3098* (PRE).

—**2323** (Lithle): 54.7 km west of Dutlwe (–AD), *Mithen 528* (PRE).

—**2325** (Lephepe): Central Kalahari, Kweneng Dist., Dinojane (–BC), *Barnard 230* (PRE).

—**2419** (Aranos): 20 miles north of Genesa (-DB), *Rogers 12567* (BOL).

—**2420** (Union's End): Kalahari Park, east of Swartpan (–BA), *Van der Walt 5795* (PRE).

—**2425** (Gaberone): Tsolafelo sewage ponds, Gaberone (–DB), *Barnes 095* (PRE).

—**2523** (Pomfrey): 8 km north-east of Werda, Botswana (–AD), *Mithen 596* (PRE).

—**2624** (Vryburg): Vryburg Dist.(–DB), *Mogg 8370* (PRE).

Precise locality unknown:

Ngamiland, *Curson 154* (PRE); Central Kalahari Gemsbok Park Reserve, *Tanaka 32* (PRE).

Other localities in Africa:

Angola, Huilla, *Dekindt 468* (isotype), and *Dekindt s.n.* (LISC).

**d. subsp. *mensensis*** (Schweinf.) Verdc. in Kew Bulletin 24: 545 (1970). Type: Ethiopia, Eritrea, at the Amba Rivulet near Geleb in Mensa (2000 m), *Schweinfurth 1820* (B†, holo., BR!, iso, [fragments] ).

*Vigna mensensis* Schweinf.: 261 (1896). *V. mensensis* Schweinf. var. *hastata sensu* Robyns: 362 (1948), no types mentioned, cited *Lebrun 8170, De Witte 2199*.

*V. mensensis* Wilcz.: 390 (1954), non Chiov. Type as above.

*V. unguiculata* subsp. *dekindtiana* var. *mensensis* (Schweinf.) Maréchal *et al*: 190 (1978).

*Root* system woody. *Stems* branched from the base, glabrous to puberulent. *Leaflets* (Figure 3f) wavy-lobulate to ovate-rhomboid, acute to acuminate, base usually cuneate, lateral ones asymmetric. *Flowers* two per inflorescence (contracted), appear to be larger than in the other two varieties with vexillum 18 × 18 mm to 30 × 40 mm, but its discerning character is the markedly longer *calyx* lobes, 5.0–14.0 mm long as opposed to the tube, 3.0–5.5 mm long (Verdcourt 1971).

Subspecies *mensensis* grows in African savannah (not yet collected in southern Africa) in swampy grasslands and open forests and interbreeds freely with var. *dekindtiana*. Mithen (1988) reports subsp. *mensensis* from states of Zaire, Burundi, sometimes Zimbabwe, and Mozambique and it seems likely that it should spread across the Eastern borders, but none has been collected in southern Africa until now. However, we regard it as important to include the subspecies in our treatment to draw collectors' attention to the fact that it may yet be encountered.

Evidence obtained from the isotype (fragments, *Schweinfurth 1820*, BR!), indicates that the style prolongation is minimal (Figure 2c). No leaflets or stipules were available, but it is clear that subsp. *mensensis* should be maintained as a category of its own in the *V. unguiculata* group.

### Specimens examined

*Schweinfurth 1828* (BR, isotype); *Chandler 1019, Geilinger s.n., Loveridge 39, Napier 1135, 2994, Newbold 3565, Polhill 123, Semsei 3924, Tweedie 3721,* all from tropical East Africa (K).

**e. subsp. *tenuis*** (E. Mey.) Maréchal *et al.* in Taxon 27: 200 (1978). Type: var. β. *oblonga* South Africa, in graminosis inter Omtendo et Omsamculo [Umzimkulu], alt. 300 ped., *Drège V. c* (P!, lecto., designated here, K!, photo.).

*Scytalis tenuis* E. Mey.: 145, 146 (1836). *Vigna tenuis* (E. Mey.) Dietrich: 1197 (1847); Harv.: 242 (1862); Verdc.: 546 (1970). Type as above.

Characterized by small, bright green, ovate or oblong, thinly textured obtuse *leaflets* of two main shapes, of uniform size on each plant, apices rounded or obtuse but apiculate, bases obtuse to cuneate in ovate leaflets, obtuse to deltoid or truncate and gibbose in oblong leaflets, lateral leaflets asymmetrical; two varieties often found growing intermingled with each other. *Stems* prostrate, seldom twining, typically glabrous or scabrous, thin, often reddish at base, leaflets dropping but stipules persistent (especially those occurring along the Natal south coast). *Stipules* small, ovate, almost wholly glabrous with short broad spurs, not deeply constricted. *Flowers* usually 2, more abortive buds present, with standard 22 × 25 mm, commonly blue. *Style* elongation horizontal, usually acute, *ca.* 0.4 mm long. *Legume* black, shorter than other subspecies, *ca.* 60 mm, scabrid with longer strigose hairs along margin [described as subserrate by Meyer (1836)].

Two varieties [as described by Meyer (1836)] are recognized:

**(i) var. *tenuis***

*Scytalis tenuis* E. Mey. var. *oblonga* E. Mey.: 146 (1836). Type as above.

Leaflets (Figure 3b) oblong to lanceolate, somewhat longer than the type but common along the Natal coast dune grasslands (Figure 8), leaflet bases truncate, almost square and two-lobed (gibbose) or the lateral ones unilobed, apices never acuminate.

Var. *oblonga* has been chosen to be var. *tenuis* as its shape best suits the name and since there is no nomenclatural preference between the two varieties; they were published simultaneously.

### Selected specimens examined

**—2230** (Messina): Thathe Vondo, Messina (–CD), *Hemm 1123* (J).

**—2632** (Bela Vista): Tongaland, Kosi Estuary (–DD), *Vahrmeyer 1226* (NH).

**—2732** (Ubombo): north of Lake Sibaya, grassland (–BC), *Verdoorn PRE 56088* (PRE).

**—2832** (Matubatuba): Richards Bay, southern sector, open dune grassland (–CC), *Ward 8664* (PRE, DWU).

**—2930** (Pietermaritzburg): 0.25 km from Inchanga abattoir turnoff on old Durban road (–DA), *Pienaar & Archer 1331* (PRE).

**—2931** (Stanger): Umdloti Beach, regularly cut grassy bank (–CA), *Pienaar 603 (PRE).*

**—3030** (Port Shepstone): Selsdon Park (Boy & Anne Brand), opposite road D203, 0.5 km from Mpenjati River, dappled shade of Eucalypts (–CD), *Pienaar 1376* (PRE).

**—3130** (Port Edward): Mzamba River Mouth, deep sandy burnt grassland (–AA), *Stirton 5630* (PRE).

**(ii) var. *ovata*** (E. Mey.) Pienaar comb. nov. Type: var. α. *ovata* South Africa, in graminosis inter Omsamkulu [Umzimkulu] et Port Natal [Durban], alt. 500 ped., *Drège V, c* (P!, holo., K!, photo.).

*Scytalis tenuis* E. Mey. var. *ovata* E. Mey.: 146 (1836). Type as for var α above.

Leaflets typically ovate (Figure 3c). Common in coastal grassland along the east coast (Figure 9).

### Selected specimens examined

**—2732** (Ubombo): Muzi Flats (–CB), *Venter 4459* (PRE).

**—2832** (Mtubatuba): Game park, St. Lucia (–AD), *Pienaar 887* (PRE).

**—2930** (Pietermaritzburg): Reservoir Hills, Durban Dist. (–DD),

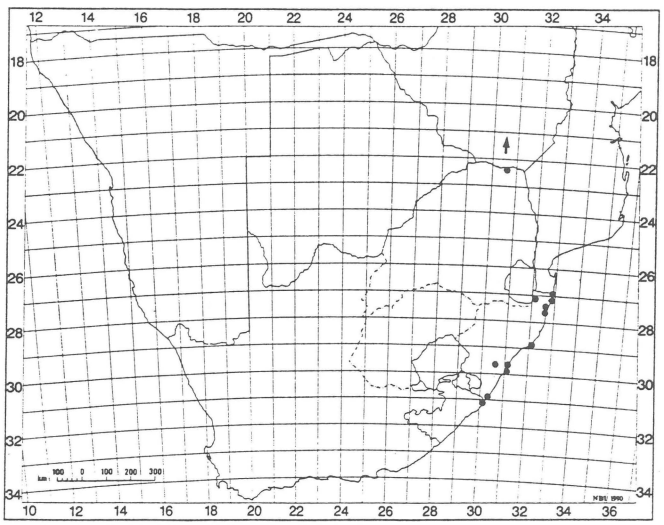

**Figure 8** The known geographical distribution of *Vigna unguiculata* subsp. *tenuis* var. *tenuis* in southern Africa.

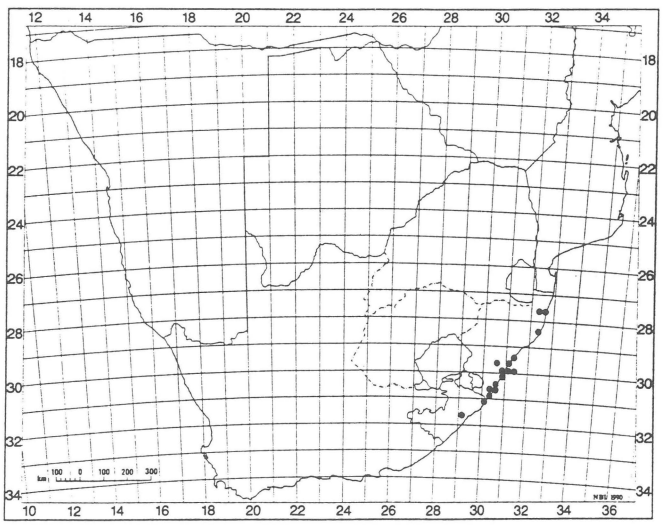

**Figure 9** The known geographical distribution of *Vigna unguiculata* subsp. *tenuis* var. *ovata* in southern Africa.

*Abraham 18* (DWU).

—**2931** (Stanger): Durban (–CC), *Wood 8443* (BOL, K, NH, PRE).

—**3030** (Port Shepstone): Nicholson's property, Skyline, St. Michael's on Sea (–CD), *Pienaar 585* (PRE).

—**3129** (Port St. Johns): dune grassland, Port St. Johns (–DA), *Moss 3191* (BM, J).

—**3131** (Port Edward): 3 km to Umtamvuna Bridge (–AA), *Pienaar 789* (PRE).

**f. subsp. *stenophylla*** (Harv.) Maréchal *et al.* in Taxon 27: 200 (1978). Syntypes: South Africa, Schoen Stroom & Vaal River, *Burke & Zeyher s.n.* & South Africa, Waterfontein, Mooierivier, Transvaal, *Zeyher 529* (BM!, K!).

*Vigna triloba* Walp. var. *stenophylla* Harv.: 241 (1862). *V. stenophylla* (Harv.) Burtt Davy: 421 (1932), non Harms (1911). Types as above.

*V. angustifoliolata* Verdc.: 547 (1970). Types as above.

Characterized by leathery, narrow-linear leaflets (Figure 3a), much longer than wide, *ca.* 20 × 2–120 × 10 mm, attenuate, obsoletely hastate, base obtuse or cuneate to sub-lobed, midrib raised above lower surface. *Stems* glabrous, scabrid to patent (in forms from the eastern Transvaal mountains), angular. *Stipules* green or brown, ovate to lanceolate, acuminate with short, oblique to slender straight spurs, glabrous with terminal cilia or scarcely ciliate in mountain forms, often recurved. *Raceme* contracted, 2-flowered, flowers somewhat smaller than in other subspecies with standard *ca.* 13 × 15 mm, pinkish violet or mauve. *Style* elongation rounded, 0.2–0.3 mm. *Legumes* black, brown to grey, 60–100 mm long, scabrid to strigose.

Commonly found in grasslands of the interior of the Transvaal and Botswana; smaller forms along coastal dune grasslands of northern Natal (Figure 10).

### Selected specimens examined

—**1821** (Andara): between Bagani camp & Mahango, grassland (–BA), *De Winter 4391* (K, PRE).

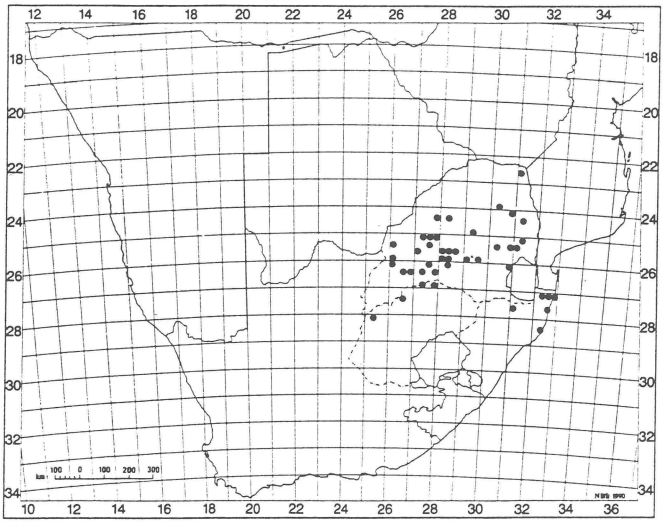


**Figure 10** The known geographical distribution of *Vigna unguiculata* subsp. *stenophylla* in southern Africa.

—**2231** (Pafuri): Klopperfontein (–CA), *Van der Schijff 2959* (PRE).

—**2330** (Tzaneen): Letaba Estates (–CD), *Grobbelaar 322* (PRE).

—**2427** (Thabazimbi): Elandshoek (–BD), *Rogers 2996* (PRE).

—**2428** (Nylstroom): Twenty-four Rivers, 13 miles north-east of Vaalwater (–AD), *Codd 960* (PRE).

—**2429** (Zebediela): Pilgrim's Rest, Riet Valley Farm (–CD), *Holy 6* (PRE).

—**2430** (Pilgrim's Rest): Shabene area (–BB), *Van der Schijff 3199* (PRE).

—**2431** (Acornhoek): Rabelais Dam, Kruger National Park (–AD), *Van der Schijff 2350* (PRE).

—**2526** (Zeerust): 10 km east of the road Zeerust–Blairbeth, south of Witpoortjie (–AC), *Van der Meulen 317* (PRE).

—**2527** (Rustenburg): south-west of Rustenburg town (–CA), *Nation 189* (BOL, K, PRE).

—**2528** (Pretoria): University of Pretoria farm, ridge behind Silverton (–CB), *Codd 869* (PRE).

—**2529** (Witbank): *ca.* 30 km from Pretoria on Witbank road (–DC), *Pienaar 1366* (PRE).

—**2530** (Lydenburg): Nelspruit (–BB), *Breyer TM 17861* (PRE).

—**2531** (Komatipoort): 1 mile north of Pretoriuskop, Kruger National Park (–AB), *Codd & De Winter 4949* (PRE).

—**2626** (Klerksdorp): 8 miles north-west of Ventersdorp (–BD), *Acocks 12403* (K, PRE).

—**2627** (Potchefstroom): Sterkfontein Caves, Krugersdorp (–BA), *Mogg 35676* (J, K, PRE).

—**2628** (Johannesburg): Benoni, Geduld Golf Course, now President Pleasure Resort (–AB), *Isaacs 51* (PRE).

—**2630** (Carolina): Sonnestraal Farm, *ca.* 9 km from turnoff on Waverley road (–BB), *Germishuizen 2939* (PRE).

—**2726** (Odendaalsrus): Bothaville, Kroonstad District (–BC), *Goosens 1162* (PRE).

—**2731** (Louwsburg): Itala Nature Reserve, Craigadam Farm (–CA), *Mc Donald 146* (PRE).

—**2732** (Ubombo): Kwa Zulu, Maputoland Plain, Sihangwana (–AB), *Liengme 596* PRE).

—**2825** (Boshoff): Bultfontein, Oppermansdrif Dam (–AB), *O'Connor 65* (PRE).

Precise locality unknown:

Kruger National Park, *Engelbrecht 6168*; Warmlaagte, north-eastern kopje, *Maguire J 32402* (J); in grass at Wonderfontein, Mooierivier, *Zeyher 522* (SAM); in grass at Wonderfontein, Bechuana Country, *Zeyher 529* (SAM); grass, Natal, *Zeyher s.n., SAM 15593* (SAM).

## Discussion

### Nomenclature and Taxonomy

*Vigna pubescens* Wilcz. (1954) was recognized as a separate species until 1978, its excessive hairiness over all plant parts being the chief discerning character. Verdcourt (1970) commented that 'further work may show that it is only a well-marked variety of *V. unguiculata*'. Our work supports this suspicion, hence our reduction of *V. pubescence* to the synonymy of *V. unguiculata* subsp. *protracta*, particularly as there is no clear discontinuity between the degree of hairiness of the typically large stipules and since the style prolongation is similar. The more velvety character of the stem pubescence may be noted but the hairs are broad-based as in all *Vigna* species. Leaf shape is too variable to be taken into account. However, it has kindly been brought to

our attention (anonymous referee) that there are marked intrasubspecific differences in the pollen characters and in the morphology of the flowers and legumes; whether this variation is continuous or discontinuous and perhaps indicative of the involvement of more than one taxon, will be given attention. It must, however, be noted that cultivation of *Vigna* species does affect the natural facies of the plants, and if clear discontinuities of characters do not occur, taxonomic divisions become artificial.

In southern Africa subspecies *protracta* prefers the warm, rain-drenched coastal grasslands. An outstanding feature of the plants is the variableness of the shape of the lush, dark-green leaflets — most common are the large trilobed, roughly strigose leaflets [typical of Meyer's (1936) *Scytalis protracta* and *Scytalis hispida* (1836)] in the eastern Cape and southern Natal. The leaflets vary, however, to triangular and even elongate-hastate as in the type, *Bredo 2161* (BR), and these unlobed forms extend northward into eastern Transvaal. In Botswana specimens collected by Mithen (*e.g. Mithen 499*), the leaflets even look much like those of *V. dekindtiana*, but the apices of the stipules are hairy on the upper surface and we prefer to include them in subspecies *protracta*.

The specimens of *V. unguiculata* subsp. *protracta* (the so-called *V. pubescens*) with typical trilobed leaflets have thick, rough, patently hairy stems which become velvety toward tropical East Africa as in *Bredo 2161*. The large and conspicuous stipules, broadly oval, represent the full scope of hairiness, namely from totally covered in long hairs as in *Bredo 2161* and some Swaziland specimens, to a few hairs only spread across the entire surface, to hairs on the ridges only, to scabrid surfaces only. They are always accompanied by long, coarse cilia along the entire margin. The specimens in the Transvaal, in a drier environment, with smaller hastate leaflets, appear to have smaller stipules, but they are still relatively large and conspicuous, ovate, with almost no constriction at the point of attachment and with short broad, often oblique spurs. The hammer-shaped appearance of the stigma in these hairy plants, with their accentuated oblique style elongation up to 1 mm long, is furthermore typical of all these plants, more correctly named *V. unguiculata* subsp. *protracta* after the basionym *Scytalis protracta* E. Mey. Since the full scope of the described characters (shapes of leaflets, hairiness, especially of the stipules) appears in *V. pubescens* Wilcz. and in all similar specimens collected in southern Africa, *V. pubescens* is regarded as conspecific with *V. unguiculata* (L.) Walp. subsp. *protracta* (E. Mey.) Pienaar.

Maréchal *et al.* (1978) found the similarity coefficient for *V. pubescens* to be 93% with *V. unguiculata* subsp. *dekindtiana* and therefore preferred to reduce it to a variety of subsp. *dekindtiana*, also recognizing var. *protracta* (proposed by Verdcourt 1970). Thorough examination of a large number of these plants in southern Africa led us to include, in addition to *V. pubescens* Wilcz. (1954), also *V. unguiculata* (L.) Walp. var. *protracta* (E. Mey.) Verdc. (1970) and *V. unguiculata* (L.) Walp. subsp. *dekindtiana* (Harms) Verdc. var. *protracta* (E. Mey.) Verdc. as proposed by Maréchal *et al.* (1978) in the synonymy of subsp. *protracta* (E. Mey.) Pienaar.

A specimen in the Linnean Society Herbarium, London, numbered 900.22 and bearing only the information CAP (Cape), appears similar to *Drège 1837* from Galgebosch (K!) and, in our opinion, may represent a Cape specimen of *V. unguiculata* subsp. *protracta*.

The concept of *V. unguiculata* subsp. *dekindtiana* in southern Africa points to the exclusion of subsp. *mensensis* Schweinf. as a variety of *V. dekindtiana*, as recognized by Maréchal *et al.* (1978). Verdcourt (1970) did mention that it differed from subsp. *dekindtiana* only in the length of the calyx lobes, but the style prolongation disproves this. The character of calyx lobes has in any case been questioned by Verdcourt for its diagnostic importance (1970, p.543). He reduced it to a subspecies of *V. unguiculata*. Maréchal et al. (1978) then reduced it further to a variety under *V. unguiculata* subsp. *dekindtiana*, again stressing the length of the calyx lobes. We do not uphold the latter decision, when considering the morphological importance of the diagnostic character of the style prolongation, although no collections with excessively long calyx lobes nor the vestigial remains of the hammer-shaped style prolongation have been made in southern Africa.

Considering the habitat of subsp. *mensensis* in semi-shade along forest edges or in open forest and marshes (Schweinfurth 1896), reason for the soft texture of the leaflets, similar to those of subsp. *dekindtiana* var. *dekindtiana*, becomes evident, as opposed to the need for the more resistant, leathery texture of those of their open grassland relations. The leaflet shape of this open forest relative of subsp. *dekindtiana*, as well as the latter, most closely approaches that of the cultivated forms. Sometimes both forms of leaflet shape appear on the same plant (Schweinfurth 1896; Wilczek 1954), the ovate-triangular ones initially and the hastate ones later. Other characters shared between *V. unguiculata* subsp. *dekindtiana* var. *dekindtiana* and subsp. *mensensis* include lanceolate stipules which tend to be brown, glabrous except for apical cilia and with slender spurs that may tend to recurve from the stem surface, thinner stems than in subsp. *protracta*, with varying pubescence from an almost glabrous, aculeate condition to scarcely patent and a pauciflorous contracted inflorescence with large, blue to purple flowers with the standard 18–30 × 20–40 mm [*V. mensensis* Schweinf. var. *hastata sensu* Robyns, according to Wilczek (1954)]. The style prolongation in the *Schweinfurth 1820* specimen examined, approaches that of *V. unguiculata*, but the prolongation itself is scarcely hammer-shaped. This places it in its own category outside the subsp. *dekindtiana* group. The calyx tube is glabrous or varyingly scabrid and horizontally wrinkled at maturity like that of *V. unguiculata* var. *dekindtiana*. Legumes are black, erect, varyingly scabrid but with longer hairs along the suture. The main differences appear to be the accentuated long calyx lobes of subsp. *mensensis* and the reduced style prolongation. We have therefore upheld its status as a subspecies of *V. unguiculata* as treated by Verdcourt (1970).

A marked difference was observed between the dry grassland forms of *V. unguiculata* var. *dekindtiana* in central Namibia and those collected in the Caprivi region of north-east Namibia. The former ones have deep turbinate root-stocks, reputed to be roasted and eaten by the local inhabitants, whereas shallow adventitious root systems occur in the latter collections, the stems tending to root when covered by soil. The stems, stipules and even the undersurfaces and

veins of some leaflets of the Caprivi forms are often flushed bright red. Stipules tend to be more commonly ovate with short, broad, oblique spurs, as opposed to the slender, reflexed ones of their dry grassland counterparts. Considering these obviously distinguishing characters (facts rarely mentioned on collectors' labels), we have decided to recognize these wild forms as two varieties, namely var. *dekindtiana* and var. *huillensis*, again, to stress the importance of visible phenotypical (and perhaps genetic) characters for breeding purposes. Var. *dekindtiana* has the papyraceous leaflet forms that vary from ovate-rhombic to hastate on the same plant. Variety *huillensis*, on the other hand, has the coriaceous, narrow-hastate form (as seen in *Dekindt 468*) of leaflets that is constant throughout, and blue-green colouring. Therefore, we have chosen to reinstate var. *huillensis* for the dry grassland forms of central Namibia and Botswana, as Baker (1871) described the leaflets as subcoriaceous and glabrous with raised veinlets on both sides; Schreiber (1970) described the thicker margins and the short, rounded basal lobes and Torre (1966) upheld the taxon. That hastate leaflets alone occur, however, is not specifically mentioned, but the obviously thinner, papyraceous, heterophyllous character of *V. dekindtiana* var. *dekindtiana*, as originally described by Harms (1902) and Baker (1871), is not specifically cancelled. It has been suggested that a new name be given to these coriaceous plants, a matter to be seriously considered.

Mithen (pers. commun.) has suggested the reinstatement of var. *huillensis* for a different reason, namely for central African collections that are pyrophytic and therefore precocious after veld-burning, an effect, thus, of the environment. A few such specimens, namely *Teixeira & M.M. 30/8* from Angola and *Milne-Redhead 1123* from Zambia are present in the PRE collections. Although the woody tubers of the variety make it possible to survive veld fires in any case, its precocious habit has not been observed in southern African collections. It should be stressed that edaphic factors appear to have the greatest influence on variety evolution in *Vigna*.

Lush (1979) maintained that the difference between subsp. *mensensis* and var. *dekindtiana* lies in the size, aroma and prolonged opening of flowers, together with the high rate of flower abcission when subsp. *mensensis* is grown in screenhouses and that Rawal (*fide* Lush 1979) had concluded that this is due to different breeding systems. Subsp. *mensensis* is an obligate outcrosser and var. *dekindtiana*, the only truly wild form, is inbreeding (Lush 1979). It was observed in the nursery of the National Botanical Institute, Pretoria, as in other parts of Africa and Canberra, that flowers of all lines of Cowpeas grown, opened only once (before dawn), and shut by midmorning. In Pretoria they are known to close with a 'bang' by 9 o'clock. Accessions of subsp. *mensensis* from southern Nigeria remained open all day (Lush 1979), were more fragrant and larger, the size of var. *dekindtiana* flowers sometimes found to intergrade with that of cultivated forms. In Rawal's experiments (Lush 1979), virtually all flowers of var. *dekindtiana* and of cultivated forms, set pods regardless of whether they were hand-pollinated, whereas hand-pollination did not increase pod-setting markedly in subsp. *mensensis*. This may be due to the flower structure. Subsp. *mensensis* has long styles so that the stigma reaches beyond the ring of anthers, whereas var. *dekindtiana* also has a long style but some of the anthers are able to reach the stigma. In cultivated lines the style is short and the stigma is surrounded by the anthers. The styles of subsp. *mensensis* bear many long hairs, known as a pollen brush (Lavin & Delgado 1990), which trap the pollen released from the anthers of the same flower, whereas those of var. *dekindtiana* are less hairy. In lines of subsp. *mensensis* from Nigeria, the receptive surface of the stigma is directed upward and surrounded by the style hairs which block off the upward movement of pollen. In other lines from Tanzania, the receptive surface is directed downward so that this condition is not constant. Lush (1979) maintained that the facts above support Verdcourt's (1970) decision to separate the two subspecies. In southern Africa, the flower structure, and consequently pollination, was naturally observed to be constant in subsp. *dekindtiana*. The question of size of the flowers may of course be environmental rather than genetic.

The recognition of *V. unguiculata* subsp. *tenuis* (E. Mey.) Maréchal *et al.* seems to be generally accepted, although Verdcourt (1970) quoted it as an independent species. Maréchal *et al.* (1978) recognize the group as a subspecies of *V. unguiculata*. Collections along the eastern Cape and Natal coasts often presented these typically creeping to rambling plants with leaflets varying somewhat in size, but the size in one plant is always more or less constant. Plants from the north coast of Natal often presented a strangely oblong, gibbose leaflet with its typical square or truncate base, the lateral leaflets being asymmetrically unilobed. These oblong leaflets are inclined to be bright green and of a tender, soft texture. For this reason, E. Meyer's (1836) varieties *ovata* and *oblonga* (the latter as var. *tenuis*) have been reinstated. Sometimes the two varieties are found growing in separate colonies, sometimes intermingled. The showy blue flowers (usually only two or occasionally three in each inflorescence) are impressive and large. Although the inflorescence appears as pronounced as in subsp. *protracta*, the buds probably abort when about three flowers have been fertilized, the number of legumes never exceeding two or three per peduncle. The extension of the style is horizontal, often subulate and *ca.* 4 mm long. Legumes are black, erect, beaked and markedly shorter than in the other subspecies, *ca.* 60 mm long.

Verdcourt (1970) and Maréchal *et al.* (1978) cited *Dolichos reticulatus* Schltr. (1897) as a synonym of *V. tenuis*. However, we suspected that the specimen belongs to *V. nervosa* Markötter as Schlechter's description aptly fits it, namely the single, small, pink flower, the beaked fruit and the elevation at which it was collected. The isotype specimen (*Evans 630*, K!) proved this suspicion to be correct. *V. unguiculata* subsp. *tenuis* is a coastal species, preferring sandy duneland, found in Natal and the eastern Cape as opposed to the inland habitat of *V. nervosa*, in grasslands with a rocky, more solid texture, at an elevation of between 1500 and 1650 m. Other specimens of *V. nervosa* from the Drakensberg area in South African herbaria include *Green 408* (NH), *Sidey 130* (PRE) and *Van den Berg 1849* (PRE). It should be noted that the occurrence of *V. tenuis* in parts of the Flora Zambesiaca Region coincides with the sandy dune parts of the country, *i.e.* lower lying parts (Mithen 1988).

Verdcourt (1970) recognized the fact that *V. stenophylla* (Harv.) Burtt Davy is a later homonym and proposed the

name *V. angustifoliolata* in its place to accommodate those members of the section *Catjang* with the extremely long, narrow leaflets. Maréchal *et al.* (1978) reinstated the former epithet as the subspecies *stenophylla* (Harv.) Maréchal *et al.* under *V. unguiculata* because of its close affinity to this species. We agree with the latter decision as the style extension beyond the stigma, generally rounded and very short (often only 1 mm long), places them undoubtedly in this group. Their stipules tend to be slender, glabrous, brown and acuminate, but with spurs that are often oblique and short, akin to subsp. *protracta*. The inflorescence is a contracted raceme bearing only two to three flowers that are generally smaller than those of the other subspecies and inclined to be pinkish mauve. Fruits are long, 60–100 mm, variably strigose and often paler (brown) than the other subspecies. The leaflets, as mentioned, are characteristically up to ten times longer than broad and are inclined to be leathery, a possible adaptation to their drier habitat, the open grassveld of western Transvaal and Botswana. Along the dune grasslands of the extreme north coast of Natal, glabrous plants with more diminutive leaflets and legumes occur. This probably suggests interbreeding with subsp. *tenuis*, *e.g. Pienaar 1363* (PRE) from the game park, St. Lucia.

A summary of the treatment of infraspecific taxa in *V. unguiculata* as proposed by Verdcourt (1970), Maréchal *et al.* (1978) and in the present paper, is supplied in Table 1.

## Uses

In West Africa, notably Nigeria, a great diversity of 'weedy types' of *V. unguiculata* is found. It is currently believed that they originated from escaped cultivars or wild plants more or less crossed with cultivars, the wild parents being the subsp. *mensensis* and var. *dekindtiana* Verdcourt (1970). It is therefore possible that this region is the centre of primary domestication of the Cowpea by the local inhabitants. However, the most derived and superior cultivated forms seem to have originated and been perfected in South-east Asia or the Far East, *e.g.* the very long, succulent pendant pods of cv. gr. *sesquipedalis* which are eaten as a green vegetable. The African cultivars derived from the wild forms normally have thin, erect pods.

Cowpea is used as hay, pasture, soil cover, green manure, a concentrate for farm animals, and as silage for which the best stage for cutting is when the first pods turn yellow and the plants contain 60% of their crude protein (Westphal 1974). Cowpea has a nutritional value as a protein food. African peoples are known to roast the tubers on hot coals, and also to use the leaves like spinach or the green pods as a vegetable. As a pot-herb, it may be used in the fresh state or dried and stored for dry-season use. In tropical Africa, the plants do not mature during a definite period, but continue to produce new leaves if cut back regularly from an early stage (Purseglove, *fide* Westphal 1974). In India the leaves are used for a green dye when mixed with *Strobilanthus flaccidifolius* Nees and *Curcuma domestica* Val. (turmeric). In Nigeria, fibres from the long peduncles of cv. gr. *textilis* are extracted for ropes.

Regarding the nutritional value of the Cowpea, valuable work has been done by Bressani (1985). The chemical composition of Cowpeas is found to be similar to that of most legumes or pulses. It contains about 23–30% protein, 62% soluble carbohydrates and small amounts of other nutrients. The protein content is influenced by genotype as well as environmental factors. Constant selection of cultivars for hybridization is employed to raise the protein content. Cowpea protein is, however, deficient in sulphur-containing amino acids, these being important where diets are based on rootcrops or other starchy foods. Addition of methionine to Cowpea protein increases the protein quality significantly. When the seedcoat is removed, the digestibility of Cowpea protein is improved. The greatest value of Cowpea in the diet lies in its use as a complement to cereal grains, *e.g.* sorghum. It is clear that the two factors that must be stressed in selection programmes, are the sulphur amino acid content and the protein digestibility (Bressani 1985). The Cowpea is eaten dried and boiled or ground to flour.

**Table 1** Summary of the delimitation of the infraspecific taxa in *V. unguiculata* as proposed by Verdcourt (1970), Maréchal *et al.* (1978) and the present authors

| Verdcourt (1970) | Maréchal *et al.* (1978) | Present study |
|---|---|---|
| *V. unguiculata* | *V. unguiculata* | *V. unguiculata* |
| subsp. *unguiculata* | subsp. *unguiculata* | subsp. *unguiculata* |
| | cv. gr. *unguiculata* | cv. gr. *unguiculata* |
| subsp. *cylindrica* | cv. gr. *biflora* | cv. gr. *biflora* (not southern Africa) |
| subsp. *sesquipedalis* | cv. gr. *sesquipedalis* | cv. gr. *sesquipedalis* (not southern Africa) |
| — | cv. gr. *textilis* | cv. gr. *textilis* (not southern Africa) |
| subsp. *dekindtiana* | subsp. *dekindtiana* | subsp. *dekindtiana* |
| — | var. *dekindtiana* | var. *dekindtiana* |
| — | — | var. *huillensis* |
| subsp. *mensensis* | var. *mensensis* | subsp. *mensensis* (not southern Africa) |
| var. *protracta* | var. *protracta* | subsp. *protracta* |
| *V. pubescens* | var. *pubescens* | subsp. *protracta* |
| *V. tenuis* | subsp. *tenuis* | subsp. *tenuis* |
| | | var. *tenuis* & var. *ovata* |
| *V. angustifoliolata* | subsp. *stenophylla* | subsp. *stenophylla* |

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